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Equation of State Measurements of Hydrogen and Deuterium up to 2 Mbar

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The high density and temperature Equation of State of hydrogen is integral to many astrophysical and planetary models. We have used the Nova laser to produce uniform and steady shocks in H_2 and D_2 to probe this strongly-coupled region where molecular dissociation and electronic excitation occur. We present the pressure (from 0.25 to 2.1 Mbar) and density on the first Hugoniot, derived from shock speed, particle speed, and compression measurements of liquid H_2 and D_2. The data show a significant increase in compressibility near 1 Mbar compared to existing widely-used equation of state models.

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